

Photothermal Thermoelastic Bending for Media with Thermal Memory

M. Nesic · S. Galovic · Z. Soskic · M. Popovic ·
D. M. Todorovic

Received: 12 February 2012 / Accepted: 13 June 2012 / Published online: 4 July 2012
© Springer Science+Business Media, LLC 2012

Abstract Photothermal thermoelastic bending depends on an optically generated dynamic thermal field distribution within a sample. A generalized description of the distribution is proposed, including the effects of a finite heat propagation velocity and a finite, non-zero time of thermal relaxation (known as *thermal memory effects* in generalized heat conduction theory), and finally the generated thermoelastic bending is calculated by using both a thin solid-plate approximation and a decoupling system of thermoelastic equations. The comparison between this model and the classical one, which does not account for thermal memory influence, has been made. If the sample is thicker than the value of its minimal thermal diffusion length, the difference between the two models becomes insignificant. Otherwise, it has been shown that the two models tend to overlap at low and high modulation frequencies of the excitation light, while in the mid-frequency range, some deviations become more apparent and thermal memory properties of the sample must be taken into account. The suggested model enables evaluation of thermal memory properties for such a solid.

M. Nesic (✉) · S. Galovic · M. Popovic
Vinca Institute of Nuclear Sciences, University of Belgrade, P. O. Box 522, 11001 Belgrade, Serbia
e-mail: mioljub@gmail.com; mialjub.nesic@vinca.rs

S. Galovic
Joint Institute for Nuclear Research, BLTF, Dubna, 141980 Moscow, Russia

Z. Soskic
Department of Applied Mechanics, Mathematics and Physics, Faculty of Mechanical Engineering
Kraljevo, University of Kragujevac, Dositejeva 19, 36000 Kraljevo, Serbia

D. M. Todorovic
Institute for Multidisciplinary Research, University of Belgrade, P. O. Box 33, 11030 Belgrade, Serbia

